

In the Specification

Please make the paragraph substitutions indicated in the appendix entitled Clean Version of Amended Specification Paragraphs. The specific changes incorporated in the substitute paragraphs are shown in the following marked-up versions of the original paragraphs:

The paragraph beginning at page 19, line 6, is amended as follows:

6 Figure 2C shows one embodiment of a method for fabricating an energy-storage device.
7 Steps 251, 253, 259, 261, and 263 are ~~the~~ substantially similar to the steps described above with
8 reference to Figure 2B. Step 255C is a step for depositing a cathode film at least partially on the
9 cathode contact film. In an embodiment, the cathode film is deposited as described above in step
10 255. In other embodiments, the cathode film is deposited according to other deposition
11 processes known in the art. The electrolyte film is formed by depositing an electrolyte material
12 to a location at least partially in contact with the cathode film (step ~~257B~~ 257C). In a preferred
13 embodiment, the electrolyte material is in contact with a substantial portion of, if not all of, a
14 surface of the cathode film. In some embodiments, an assist source simultaneously supplies
15 energized particles to the electrolyte material as it forms the electrolyte film. In an embodiment,
16 the assist source supplies a beam of energized ions of an assist material different than the
17 electrolyte material. In one embodiment, the second material beam is directed to the same
18 location on the substrate as the electrolyte material. The energized ion beam assists in
19 controlling growth of the structure of the electrolyte film. The ion beam is unfocused in one
20 embodiment. The ion beam is ~~focussed~~ focused in another embodiment.

The paragraph beginning at page 25, line 5, is amended as follows:

5 Figure 7 shows another embodiment of a depositing apparatus 705 according to the
6 teachings of the present invention. Depositing apparatus 705 includes a reaction chamber 707 in
7 which is positioned an elongate, flexible substrate 709 on which an energy-storage device is to be
8 fabricated. The substrate 709 is fed from a source roll 710 over an arched thermal control surface
9 715 and taken up by an end roll ~~713~~ 718. A first material source 711 is provided in the chamber 707
10 and is a physical deposition source. First source 711 produces a beam of adatoms 712 of a
11 material to be deposited on the substrate 709. In one embodiment, the first source 711 is an arc
12 source including, for example, a cathodic arc source, an anodic arc source, and a CAVAD arc
13 source. In another embodiment, the first source 711 is a physical vapor deposition source
14 including, for example, a sputtering source. In another embodiment, source 711 is a chemical
15 vapor deposition source. Moreover, source 711, in some embodiments, represents a plurality of
16 different material sources. Beam 712 is focused on a location 719 on the substrate 709 whereat
17 the adatoms in the beam are deposited to form a film layer of an energy-storage device. An assist
18 source 713 is provided in the chamber 707 and produces a beam of energized particles 714
19 directed at the substrate 709. In an embodiment, the assist source 713 produces a beam of
20 energized ions 714. The energized particle beam 714 provides the energy required to control
21 growth and stoichiometry of the deposited material of the first beam 712. Thus, a crystalline
22 structure is formed on the substrate 709 as is explained in greater detail herein. The substrate
23 709, in one embodiment, is an elastomer, polymer, or plastic web or sheet on which the energy-
24 storage device is fabricated. Substrate 709, being elongate, allows a plurality of energy-storage
25 devices to be deposited on successive locations of the substrate, thereby improving the rate of
26 energy device production. Moreover, a plurality of deposition apparatuses 705 or sources 711, in
27 some embodiments, are provided for simultaneously depositing a plurality of films at different
28 locations on the substrate 709.

The paragraph beginning at page 26, line 8, is amended as follows:

8 The above provides descriptions of various embodiments of systems in which the present
9 invention is performed to produce energy-storage devices or energy-conversion devices. It is
10 within the scope of the present invention to combine the elements of the systems in different
11 ways than shown and described as long as the methods described herein are performable with
12 such a system. For example, in some embodiments, the flexible substrate 709 and rolls 710, ~~713~~ 718
13 can be combined with any of the embodiments shown in Figures 3A-6. In some embodiments,
14 the thermal source 725 is also combinable with any of the embodiments of Figures 3A-6. In
15 some embodiments, the pivotable assist sources 413 are combinable with any of the
16 embodiments of Figures 3A, 3B, 5A, 5B, and 7. In some embodiments, the material sources
17 511A, 511B, and 511C are combinable with embodiments of Figures 3A-5A and 6-7.

The paragraph beginning at page 26, line 18, is amended as follows:

18 In one embodiment, the electrode second film, e.g., films 59 or 71 is a lithium-
19 intercalation material which overlays at least part of the first film, e.g., contact films 57 or 63, but
20 does not extend beyond the boundary of the first film. Thus, the intercalation second film
21 remains in a solid state during discharging and charging of the energy-storage device. In some
22 embodiments, the second film is deposited using the first deposition source simultaneously with
23 the secondary source supplying energetic ions to the growing second film. In some
24 embodiments, the first deposition source is a physical vapor deposition source. In some
25 embodiments, the secondary source is an ion source supplying energetic ions from a source gas
26 comprising oxygen (e.g., O_2 O_2) or nitrogen (e.g., N_2 N_2). The source gas, in another embodiment,
27 comprises a noble gas, e.g., argon, xenon, helium, neon, and krypton. The source gas, in yet
28 another embodiment, comprises a hydrocarbon material such as a hydrocarbon precursor.

29 Selection of the secondary source gas is based on the desired effect on the stoichiometry of the
30 deposited film. The secondary source, in one embodiment, provides a focused beam of energized

1 ions. The secondary source, in one embodiment, provides an unfocused beam of energized ions.
2 The energized ions provide energy to the lithium-intercalation material in the range of about 5 eV
3 to about 3,000 eV. In one embodiment, the energy range of is about 5 eV to about 1,000 eV. The
4 energy range in a further embodiment is about 10 eV to about 500 eV. The energy range in a
5 further embodiment is about 30 eV to about 300 eV. In another embodiment, the energy range is
6 in the range of about 60 eV to 150 eV. In another embodiment, the energy range is about 140 eV.

7 In an embodiment, the second film has a thickness of greater than 10 microns. In one
8 embodiment, the second film has a thickness in the range of about 10 to 20 microns. In one
9 embodiment, the second film has a thickness in the range of about 1 to 5 microns.

The paragraph beginning at page 27, line 10, is amended as follows:

10 An electrolyte third film, e.g., films 61, 61C or 73, having ionic transport qualities but not
11 being electrically conductive (an electrolyte) is deposited so as to completely overlay the second
12 deposited film. In one embodiment, the third film is deposited using a first deposition source and
13 a secondary source supplying energetic ions to the growing film. In some embodiments, the first
14 deposition source is a physical vapor deposition source. In some embodiments, the secondary
15 source is an ion source with the capability of supplying energetic ions having an energy greater
16 than 5 eV. In another embodiment, the energy range is about 5 eV to about 3,000 eV. In one
17 embodiment, the energy range of is about 5 eV to about 1,000 eV. The energy range in a further
18 embodiment is about 10 eV to about 500 eV. The energy range in a further embodiment is about
19 30 eV to about 300 eV. In another embodiment, the energy range is in the range of about 60 eV
20 to 150 eV. In another embodiment, the energy of the ions from the secondary source is about 140
21 eV. In some embodiments, the secondary source includes oxygen (e.g., O_2 O_2) or nitrogen (e.g.,
22 N_2 N_2) gas. The secondary source gas, in another embodiment, includes a noble gas, e.g., argon,
23 xenon, helium, neon, and krypton. The secondary source gas, in another embodiment, includes a
24 hydrocarbon material such as a hydrocarbon precursor. Selection of the secondary source gas is
25 based on the desired effect on the stoichiometry of the deposited film. The secondary source, in
26 one embodiment, provides a focused beam of energized ions. The secondary source, in one
27 embodiment, provides a non-focused beam of energized ions. It is desirable to make the
28 electrolyte, third layer as thin as possible and prevent the cathode and anode layers from
29 shorting. In an embodiment, the third film has a thickness of less than 1 micron. In one
30 embodiment, the third film has a thickness in of less than 5,000 Angstroms. In another

1 embodiment, the third film has a thickness of less than 1,000 Angstroms. In another
2 embodiment, the third film has a range of about 10 Angstroms to about 100 Angstroms.

The paragraph beginning at page 28, line 8, is amended as follows:

8 An anode, fourth film, e.g., film 65 or 75 includes from a lithium-intercalation material
9 that is deposited on and overlays the third film but not contacting first film (barrier) or second
10 film (cathode). In one embodiment, the fourth film is deposited using a first deposition source
11 simultaneously with a secondary source supplying energetic ions to the growing fourth film. In
12 some embodiments, first deposition source is a physical vapor deposition source. In some
13 embodiments, the secondary source is an ion source supplying energetic ions from a source gas
14 that includes oxygen (e.g., O_2) or nitrogen (e.g., N_2). The source gas, in another embodiment,
15 includes a noble gas, e.g., argon, xenon, helium, neon, and krypton. The source gas, in another
16 embodiment, includes a hydrocarbon material such as a hydrocarbon precursor. Selection of the
17 secondary source gas is based on the desired effect on the stoichiometry of the deposited film.
18 The secondary source, in one embodiment, provides a focused beam of energized ions. The
19 secondary source, in another embodiment, provides an unfocused beam of energized ions. The
20 energized ions provide energy to the lithium-intercalation material in the range of about 5 eV to
21 about 3,000 eV. In one embodiment, the energy range of is about 5 eV to about 1,000 eV. The
22 energy range in a further embodiment is about 10 eV to about 500 eV. The energy range in a
23 further embodiment is about 30 eV to about 100 eV. In another embodiment, the energy range is
24 in the range of about 60 eV to 150 eV. In another embodiment, the energy range of the ions from
25 the secondary source is about 140 eV. In an embodiment, the fourth film has a thickness of
26 greater than 10 microns. In one embodiment, the fourth film has a thickness in the range of
27 about 10 to 40 microns.

The paragraph beginning at page 32, line 3, is amended as follows:

3 In some embodiments, the materials and compositions of photovoltaic cell 800 are
4 conventional CdS/CdTe materials such as is described in U.S. Patent No. 4,207,119, which is
5 incorporated by reference; with the additional processing according to the present invention to
6 anneal or treat the surface (e.g., by ion-assist beam) of the films as they are deposited~~using~~. In
7 other embodiments, the compositions used are as described in the following publications, each of
8 which is incorporated by reference: R.W. Birkmire et al, "Polycrystalline Thin Film Solar Cells:
9 Present Status and Future Potential," Annu. Rev. Mater. Sci. 1997.27:625-653 (1997); T.L. Chu
10 et al, "13.4% Efficient thin-film CdS/CdTe Solar Cells," J. Appl. Phys. 70 (12) (15th December
11 1991); T. Yoshida, "Photovoltaic Properties of Screen-Printed CdTe/CdS Solar Cells on Indium-
12 Tin-Oxide Coated Glass Substrates," J. Electrochem. Soc., Vol. 142, No. 9, (September 1995);
13 T. Aramoto et al., "16% Efficient Thin-Film CdS/CdTe Solar Cells," Jpn. J. Appl. Phys. Vol. 36
14 pp 6304-6305 (Oct. 1997); R.B. King, ed. "Encyclopedia of Inorganic Chemistry" Vol 3., pp
15 1556-1602, John Wiley & Sons Ltd., (1994).

The paragraph beginning at page 32, line 20, is amended as follows:

20 In a heterojunction photovoltaic cell, the semiconductor films are formed of different
21 materials. For a rectifying junction, the semiconductor films must also be of different type, that
22 is p or n type. The junction between the two semiconductor films is both a pn junction and a
23 heterojunction. The first semiconductor film on which solar light is incident has a band gap
24 higher than that of the second semiconductor film. The band gap of a semiconductor is the
25 energy separation between the semiconductor valance band and the conduction band. The band
26 gap of this first semiconductor film is chosen so that it corresponds to light in the short
27 wavelength region of the solar spectrum. Photons of light having energy equal to or greater than
28 the band gap of the first semiconductor film are strongly absorbed, but photons of light of energy
29 less than the band gap of the first semiconductor pass through the first semiconductor and enter
30 the second semiconductor film. Examples of materials used for the first semiconductor film

1 include CdS, ZnS, CdZnS, CdO, ZnO, CdZnO, or other wide band gap semiconductors like SiC,
2 GaN, InGaN, and AlGaN. The second semiconductor film is chosen from materials that have
3 band gaps that correspond well to the long wavelength onset of solar radiation. Materials such as
4 CdTe, ~~CuInSe₂~~ CuInSe₂, InP, GaAs, InGaAs, InGaP, and Si are examples of materials for the second
5 semiconductor film.

The paragraph beginning at page 49, line 19, is amended as follows:

19 Figure 15H shows that the batteries have been folded along the fold lines to form a stack
20 of three batteries ~~1100~~, 1110, 1110' and 1110". The folds shown in Figure 15H are a fan fold.
21 Once the fan fold is formed, as shown in Figure 15H, the fan folded battery, including three cells
22 1330, can be formed in any desired shape, such as ~~those shown in~~ square-sided shape 1503 of
Figure 15C, angle-sided shape 1504 of 15D and curve-sided shape 1505 of 15E.
23 The three-celled or multi-celled unit 1330 can be adhered to the interior or exterior surface of any
24 electronic device, as discussed above. It should be noted that the fan fold can include more than
25 three batteries or less than three batteries. The inventive aspect is that it includes a plurality of
26 batteries. The cells 1110, 1110' and 1110" can be attached to one another so that the cells are in
27 series after they are diced. Another possibility is that the electrical contacts for each of these
28 could be put in contact with one another as a result of fan folding the multi-celled unit 1330.

The paragraph beginning at page 49, line 29, is amended as follows:

29 Figures 15I, 15J and 15K show yet another embodiment of the invention. In this
30 particular embodiment of the invention, the sheet of electrical cells 1300 includes a plurality of

1 cells including 1110 and 1110'. The entire sheet 1300 is then vacuum formed to form more or
2 less an egg carton 1350 with individual battery cells 1110 and 1110' being formed within well
3 1360 and 1362 in the sheet 1300. Between the wells 1360 and 1362 is a living hinge 1370. The
4 batteries 1110 and 1110' are at the bottom of each well ~~1160 and 1162~~ 1360 and 1362, as shown in Figure 15K.
5 The living hinge 1370 is positioned between the two wells 1360 and 1362. The first cell 1360
6 can be folded on top of the second well 1362 to form an electronic device enclosure 1380, as
7 shown in Figure 15L. It should be noted that the size of the battery portions 1110 and 1110' can
8 be limited or placed so that other traces and room for other electronic devices can be added so
9 that a total circuit can be formed within a disc enclosure. This provides for an advantage that
10 wherein the electronic component could be directly placed into the wells 1160 and 1162 at sites
11 formed at the same time as the batteries were deposited onto the sheet 1300. After placing all the
12 various electronics, the electronic device can be formed merely by dicing two of the wells 1360
13 and 1362 so that they form a top and bottom of the device enclosure 1380. All sorts of electronic
14 devices could be included, including an LCD or other display device. The LCD may be readable
15 directly through a sheet if it is transparent or the sheet, or one of the wells 1360 and 1362, may
16 be provided with an opening that would correspond to an opening or face of the display of an
17 LCD or other display device. Thus, the sheet and the deposited battery thereon can ultimately
18 become the exterior surface or the enclosure for the device formed on the sheet. This has a great
19 advantage in that the process steps necessary to form a device are or can be quite easily and
20 efficiently done in a continuous process. This would lead to very efficient manufacturing of
21 electronic devices.

The paragraph beginning at page 50, line 22, is amended as follows:

22 Figure 16A is a plan view of a sheet including a plurality of cells 1110 according to this
23 invention. Figure 16A, 16B and 16C show a way to form a laminated battery cell and possibly
24 laminated battery cell and electronics for a smart card or other invention that includes a battery
25 and electronics within a card. The sheet 1300 shown in Figure 16A includes cells 1110. The
26 sheet also includes fold lines 1390 and 1392. The sheet 1300 is diced into individual sections,
27 which include fold lines 1390 and 1392, as well as a battery cell site 1110. The battery cell site
28 might also include electronics that are also deposited with the battery or energy source onto the
29 sheet 1300. The diced portion 1400 includes one portion including the cell 1100 and two blank
30 portions 1402 and 1403. The diced portion 1400 is then fan folded, as shown in Figure 16C.

1 Once a fan fold has been formed, the cell portion 1110 is captured between the two unpopulated
2 sheet portions 1402 and 1403 and will provide an extra protective layer. The excess portions of
3 the sheet 1300 can be trimmed, as shown in Figure 16D to produce a smart card or card including
4 both a battery 1110 and electronic, as shown as item 1600E in Figure 16E.

The paragraph beginning at page 51, line 5, is amended as follows:

5 Figure 17 is an exploded perspective view of a diced portion of a sheet 1300 which
6 includes one battery cell 1110 rolled around an electrical motor 1500. In this case, the diced
7 portion-~~1300~~, which includes a cell 1110, is an elongated strip 1510 from the original sheet 1300.
8 The elongated strip 1510 may include several batteries placed in series or one elongated battery
9 that is laid down as a strip on the sheet 1300. The electrical motor is electrically connected to the
10 anode and cathode of the battery and then rolled on to the electrical motor 1500. In this case, the
11 strip 1510, on which the battery has been deposited, becomes the case for the electrical motor or
12 also can be viewed as being a part of the case of the electrical motor. The electrical motor can be
13 provided with a sprocket 1520 that is used to drive another gear 1530 having a shaft 1532
14 attached thereto. As shown in Figure 17, a chuck 1540 is placed upon the shaft 1532 to form a
15 drill or other power tool. Advantageously, the power tool could be light and compact, as well as
16 being capable of being recharged a multiplicity of times. The power tool could be a hand held
17 drill for homeowner use or a smaller device, such as a Dremel-brand rotary hand tool.

The paragraph beginning at page 52, line 2, is amended as follows:

2 Figures 18C and 18D show another embodiment of the invention for a lighting device. In
3 this particular embodiment, again a strip 1600 is provided with a switch 1602 and an LED 1604.
4 In this particular embodiment, the LED is positioned so that it extends beyond the length of the
5 sheet 1600. In this particular embodiment, the sheet 1600 is rolled along its longer dimension
6 around the LED 1604 to form an elongated case having the LED 1604 at one end of the case and
7 a switch 1602 at the other end of the case. This forms a light emitting diode light 1630 in which
8 the ~~die~~ sheet 1600 is part of the case.

The paragraph beginning at page 53, line 17, is amended as follows:

17 A second process is shown in Figure 21B. The second process shown in Figure ~~19B~~ 21B is
18 useful for devices in which the battery 1110 may be removed easily from the enclosure portion.
19 As before, the first step, depicted by reference numeral 1930, is to determine if the electronics are
20 obsolete. If they are, the battery 1110 is merely removed from the case for the enclosure portion
21 and recycled for use in another enclosure portion having a similar contour, as depicted by
22 reference numeral 1950.

The paragraph beginning at page 56, line 17, is amended as follows:

17 Figure 22G shows a block diagram perspective view of an integrated device ~~2207~~ 2203
18 implementing circuit 2200 of Figure 22A having the battery 2320 and the circuit 2330 built side-
19 by-side on a substrate 2310. In some embodiments, a pattern of conductive areas or traces is
20 deposited on substrate 2310, and the successive layer(s) of battery 2320 and circuit 2330 are then
21 deposited. In some embodiments, circuit 2330 consists only of these conductive traces. In other
22 embodiments, one or more of the process steps or deposited layers of battery 2320 and circuit
23 2330 are common, and thus performed at substantially the same time for both circuit 2330 and
24 battery 2320, thus increasing the reliability, speed and yield of fabrication and lowering the cost
25 of fabrication. In the embodiment shown, trace 2318 is deposited on substrate 2310 and forms a
26 common bottom electrical connection for both circuit 2330 and battery 2320. Other aspects of
27 Figure 22G can be understood by reference to Figures 22A-22C.

The paragraph beginning at page 58, line 1, is amended as follows:

1 Figure 24A shows a perspective view of an embodiment 2400 of the present invention
2 having a battery 2320 overlaid with an integrated device 2430. In some embodiments, integrated
3 device ~~2340~~ 2430 is a so-called supercapacitor relying on either charge accumulation on opposing
4 sides on an insulator (as in a capacitor) or ion transport across an electrolyte (as in a battery), or
5 both charge accumulation and ion transport to store electrical energy. In some embodiments,
6 integrated device ~~2340~~ 2430 includes a photovoltaic cell of conventional construction deposited
7 directly on battery 2320.

The paragraph beginning at page 58, line 8, is amended as follows:

8 Some embodiments further include a separately fabricated circuit device such as an
9 integrated circuit chip 2440 that is wire-lead bonded to device 2430 using wire 2441, to device-
10 battery common terminal 2324 using wire 2443, and to bottom battery contact 2322 using wire
11 2442. For example, in one embodiment having a supercapacitor device 2430, integrated circuit
12 ~~2430~~ 2440 includes a wireless communication circuit that uses the battery for overall power needs and
13 uses supercapacitor device 2430 for quick-burst power needs such as for transmitting short burst
14 of data to an antenna. Other embodiments include other fabricated circuit devices such as
15 switches, LEDs or other light sources, LCD displays, antennas, sensors, capacitors, resistors, etc.,
16 wired to device 2400.

The paragraph beginning at page 62, line 23, is amended as follows:

23 Figures 25B-25E show a fabrication sequence for cofabrication of solid-state integrated
24 circuits and solid-state energy source such as that described above, but onto a packaged IC 2540.
25 Figure 25B shows a plan view and Figure 25C shows an elevational view of IC 2540. In some
26 embodiments, IC 2540 includes a silicon chip 2545 having integrated components such as
27 transistors, resistors, memory, etc., a lower substrate ~~2540~~ 2546, and a wiring superstrate 2544 having
28 deposited wires ~~2540~~ 2543 that extend to bonding vias 2542. Figure 25D shows a plan view and
29 Figure 25E shows an elevational view of an integrated battery-IC 2501. Battery-IC 2501
30 includes a cathode 2326 (e.g., lithium cobalt oxide), electrolyte layer 2327 (e.g., LiPON), and

1 anode layer 2328 (e.g., including copper, carbon, lithium, lithium-magnesium, and/or other
2 suitable anode material). Passivation overcoat layer 2329 suitable to protect the inner
3 components of battery 2320 is then deposited or grown.

The paragraph beginning at page 63, line 4, is amended as follows:

4 In one embodiment, the ~~product~~ packaged IC 2540 product is formed by conventional means. All
5 machine work and cleaning is accomplished. The package 2540 is sent to energy processing for
6 deposition of battery 2320 or other energy-storage device. The design of the package included a
7 suitable area 2549 for deposition of battery components. Using shadow masks with sufficient
8 overlay accuracy, the necessary components of the energy structure (e.g., a battery and/or
9 photovoltaic cell) are deposited using the methods described above. A final passivation coating
10 2329 is applied to the energy stack structure. The package with energy structure integrated is
11 sent for assembly.

The paragraph beginning at page 63, line 28, is amended as follows:

28 Figure 25F shows a block diagram of a layer-deposition system 2560 much the same as
29 that of Figure 24B, however rather than using a sheet of polymer or other homogenous substrate
30 material 2410, system 2560 starts with a sheet 2561 having a plurality of processed ~~circuits~~
packaged ICs 2540 that are received by takeup reel 2563.

The paragraph beginning at page 64, line 4, is amended as follows:

4 Figure 26A shows a perspective view of an device 2600 of the present invention having
5 an integrated circuit 2510 overlaid on its back with a battery 2320. This embodiment is similar
6 to that of Figure 25A, except that the battery 2320 is deposited on the back of IC 2510, and is
7 wire-lead bonded to contact 2514 using wire 2614 from battery contact 2519 and to contact 2515
 using wire 2615 from battery contact 2518.

The paragraph beginning at page 64, line 26, is amended as follows:

26 In some embodiments, embodiment 2600 further includes an antenna or electromagnetic
27 radiation receiving loop ~~2660~~ 2662 fabricated on a surface of integrated circuit 2510, for example, on
28 the opposite side as that facing battery 2320. In some such embodiments, device 2600 also
29 includes one or more devices 2650 such as sound transducers for such applications as a hearing
30 aid having an combined transducer-battery-amplifier device in order to provide a radio

1 frequency-wave-rechargeable hearing aid which could be taken out of the ear at night and placed
2 in an RF-emitting recharging stand (e.g., that of Figure 27M), avoiding the need to replace
3 batteries or even to electrically connect to an external recharging circuit.

The paragraph beginning at page 65, line 4, is amended as follows:

4 In various embodiments, such an antenna or electromagnetic radiation receiving loop
5 ~~2660~~ 2662 is fabricated on device 2202, 2203, ~~2203~~, 2204, 2206, 2207, 2208, 2300, 2400, or 2500 (or
6 2700 described below) or other battery devices described herein. In some such embodiments,
7 electromagnetic radiation received wirelessly by antenna ~~2660~~ 2662 can be such low-frequency
8 radiation as 50- or 60-hertz magnetic radiation from a coil connected to house current (e.g., that
9 of Figure 27L). In other such embodiments, RF radiation such as radio, TV, cellular, etc. having
10 frequencies up to and exceeding 2.4 GHz is received. In some embodiments, multiple antennae
11 are used, e.g., one for transducing communications signals and another for receiving recharging
12 signals.

The paragraph beginning at page 67, line 17, is amended as follows:

17 Figure 27L shows an perspective view of a device 2700 of Figure 27E, but further
18 including a photovoltaic cell 2650, at a light-recharging station that includes lamp 2791. In some
19 embodiments, device 2700 is fabricated in a shape to fit in the ear, includes sound transducers,
20 and functions as a hearing aid that can be recharged an indefinite number of times, eliminating
21 the need to replace its battery.

The paragraph beginning at page 67, line 26, is amended as follows:

26 Solid-state rechargeable batteries such as those described above have the unique ability of
27 being integrated directly with the electronics they will power. Further integration of thin-wire
28 antenna/coil ~~2660~~ 2662 or 2750 to be used as one of the coils of a two-part transformer such as shown
29 in Figure 27K and/or RF-scavenging technology such as that used in keyless entry systems
30 allows the recharging of the solid-state thin-film battery 2320 wirelessly (through the air). Using

1 techniques already common in RF I.D. tagging, the communicated energy is converted into a
2 D.C. voltage and used to perform functions on board. In the case where a battery already exists
3 on board, the D.C. voltage is used to power up recharge circuitry to wirelessly recharge the on-
4 board battery.

The paragraph beginning at page 69, line 5, is amended as follows:

5 Figure 31C shows one method for making a pacemaker 3102. The method includes a
6 plurality of steps carrying the reference numbers 3194, 3195, 3196 and 3197. The pacemaker
7 3102 includes a first half 3131 and a second half 3130. In the initial step, 3194, the second half 3130
8 is provided. A battery cell 1110 is formed on an interior surface of the pacemaker 3102, as
9 shown by step 3195. The single cell 1110 is deposited on the interior surface, as shown by step
10 3195. The electronics 3150 are then placed onto the battery 1110 to form a circuit with the
11 battery 1110, as depicted by step 3196. The first half 3131 of the enclosure is placed over the
12 second half 3130 to form the assembled pacemaker 3102, as depicted by step 3197.

The paragraph beginning at page 70, line 24, is amended as follows:

24 Of the 2 billion rechargeable batteries consumed in the United States in 1998, only about
25 300 million were actually recycled. That means about 1.7 billion recyclable batteries made it
26 into landfills. Although more and more of these batteries are technically environmentally safe,
27 this still represents a significant load on the landfill situation in the USA. The present invention
28 provides a solution that will have its greatest impact as solid-state lithium-ion batteries begin to
29 dominate the rechargeable battery market. In this invention, solid-state lithium-ion batteries have
30 a date code and/or recycle value associated with them. Because of the very large (over 40,000)

1 number of charge/discharge cycles possible with solid-state lithium batteries, the average
2 expected life of a cell could exceed 100 years. It is therefore very likely that the product in
3 which the cell is placed will lose its usefulness well before the battery cell is depleted. Thus,
4 when the battery reaches the end of its useful life based on the obsolescence of the product it was
5 in, the consumer will be enticed to recycle the battery based on the value returned to the
6 consumer in exchange for recycling. This value could be a function of the date code and
7 application the battery was used in. The recycler 2810 then disassembles the unit 2800, tests the
8 single cells 2801, and then rebuilds the cells in whatever configuration is most in demand at that
9 time. The rebuilt unit ~~2800~~ could then be sold at an appropriate cost and warranty on
10 performance.

The paragraph beginning at page 72, line 22, is amended as follows:

22 Figure 29A shows a block diagram of a layer-deposition system 2960. System 2960 has
23 layer deposition sections 2962 much the same as those of ~~Figure system~~ 2460 of Figure 24B, except that
24 it is set up to deposit layers onto wafers 2961 (or onto diced ICs 2510 rather than onto flexible
25 substrates), resulting in processed wafers 2963. Figure 29B shows a perspective view of a partially processed wafer 2964 having
26 battery material 2320 on wafer 2961 or IC 2410.

The paragraph beginning at page 72, line 27, is amended as follows:

27 Figure 29C shows a block diagram of a layer-deposition system 2965. System 2965 has
28 layer deposition sections 2962 much the same as those of ~~Figure system~~ 2465 of Figure 24D, except that
29 it is set up to deposit layers onto wafers ~~2961~~ 2966 (or onto diced ICs 2510 rather than onto flexible
30 substrates) by layer-deposition sections 2967, resulting in processed wafers 2968.

Figure 29D shows a perspective view of a processed sheet 2969 having battery

1 material 2320 on wafer 2961 or IC 2410 and covered by a device 2430 such as a photovoltaic
2 cell.

The paragraph beginning at page 73, line 3, is amended as follows:

3 Figure 29E shows a block diagram of a layer-deposition system 2965. In some such
4 embodiments, system 2965 deposits layers forming a photovoltaic cell device 2650 onto a wafer
5 2971 or IC 2510. Figure 29F shows a perspective view of a partially processed wafer 2974.
6 Figure 29G shows a block diagram of a layer-deposition system 2960. In some such
7 embodiments, system 2960 deposits layers of a battery 2320. Figure 29H shows a perspective
8 view of a processed wafer 2979. In some embodiments, wafer 2979 represents a single device,
9 and in other embodiments, wafer 2979 is diced or cut into a plurality of individual devices and
10 then wired as necessary to connect the signals on the top of the device to the bottom of the
11 device. Figure 29I shows a perspective view of wired diced final device 2600 having wires 2914 and 2915.

The paragraph beginning at page 74, line 5, is amended as follows:

19 Figure 31B shows the method for making the pacemaker ~~3100~~ 3101. The method is comprised
20 of a plurality of steps carrying the reference numbers 3190, 3191, 3192 and 3193. The
21 pacemaker 3100 includes a first half 3131 and a second half 3130. A plurality of battery cells 1110 are
22 formed on a substrate material 3140, as shown by step 3190. The substrate material 3140 is
23 diced or cut resulting in a single cell 1110 on the sheet as diced. The single cell 1110 is
24 adhesively bonded to the second half 3130 of the pacemaker 3100, as shown in step 3191. The
25 electronics 3150 are then placed onto the battery 1110 to form a circuit with the battery 1110, as
26 depicted by step 3192. The first half 3131 of the enclosure is placed over the second half 3130 to
27 form the assembled pacemaker 3100.